FIREFLY
RN-240 & RN-422

Bluetooth Serial Adapter

Install Guide and User Manual
Version 1.0

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Overview

The FireFly serial adapter is compact, versatile Class 1 Bluetooth serial adapter. It enables wireless connections to any legacy serial port and supports bi-directional RS232 or RS422 signaling at a rate of up to 464Kbps. Just attach the FireFly to your device's RS232/EIA232/422 port, connect over Bluetooth, and you have a wireless cable replacement solution. The transmit range can be up to 330' (100M), depending upon environmental factors.

FireFly Bluetooth adapter can be used as a Bluetooth Master or Slave device. The SPP connection to the unit appears via a virtual COM interface. Data is sent and received on the client exactly as if a serial cable was connected to a real COM port on the client.

FireFly can also be used in cable replacement mode where two Roving Networks Bluetooth devices are paired using the configuration switches. The USB to Bluetooth (RN-USB-X) has pairing switches and can be used with the FireFly BP to create a wireless connection to a PC without using the PC's Bluetooth stack. For more information on cable replacement, please refer to our "Cable Replacement Application Note" on the website.

Status LEDs

The GREEN LED shows the Bluetooth connection status and the adapter operational mode. Upon boot up, it blinks two times per second. In configuration mode, it blinks at a fat rate of ten times per second. When the module is in discoverable or idle mode, the GREEN LED blinks one time per second. When the module is in connected sate, the GREEN LED is solid ON.

MODE	GREEN LED BLINK
In Configuration mode	Fast, 10 x per second
Boot up, Remote Configurable	2 times per second
Discoverable/Idle	1 time per second
Connected	On Solid

The yellow LED blinks when data is sent or received on the serial interface. This does not indicate that the data was sent over the Bluetooth connection. If the yellow LED is not flashing when your device is sending data to the serial port, you likely have the connection or flow control incorrectly set.

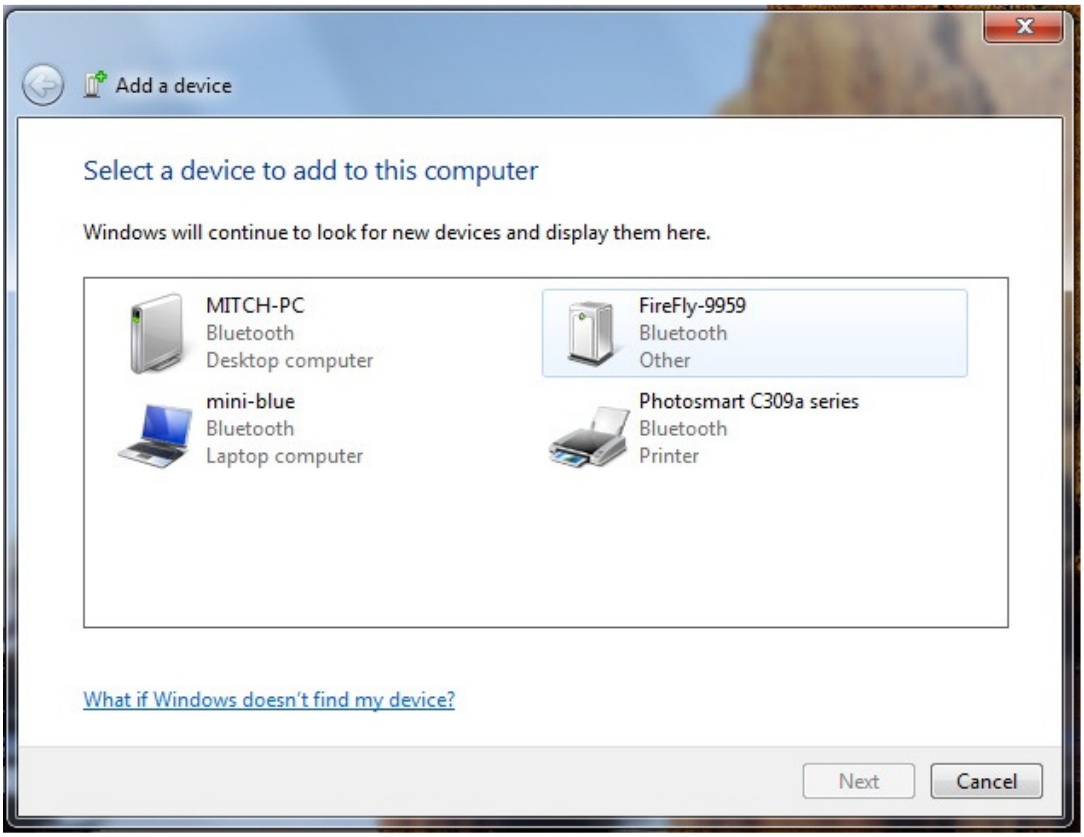
Some versions of RN-240 have a RED LED. This LED blinks when there is data being received over the RF link.

Making a Bluetooth Connection

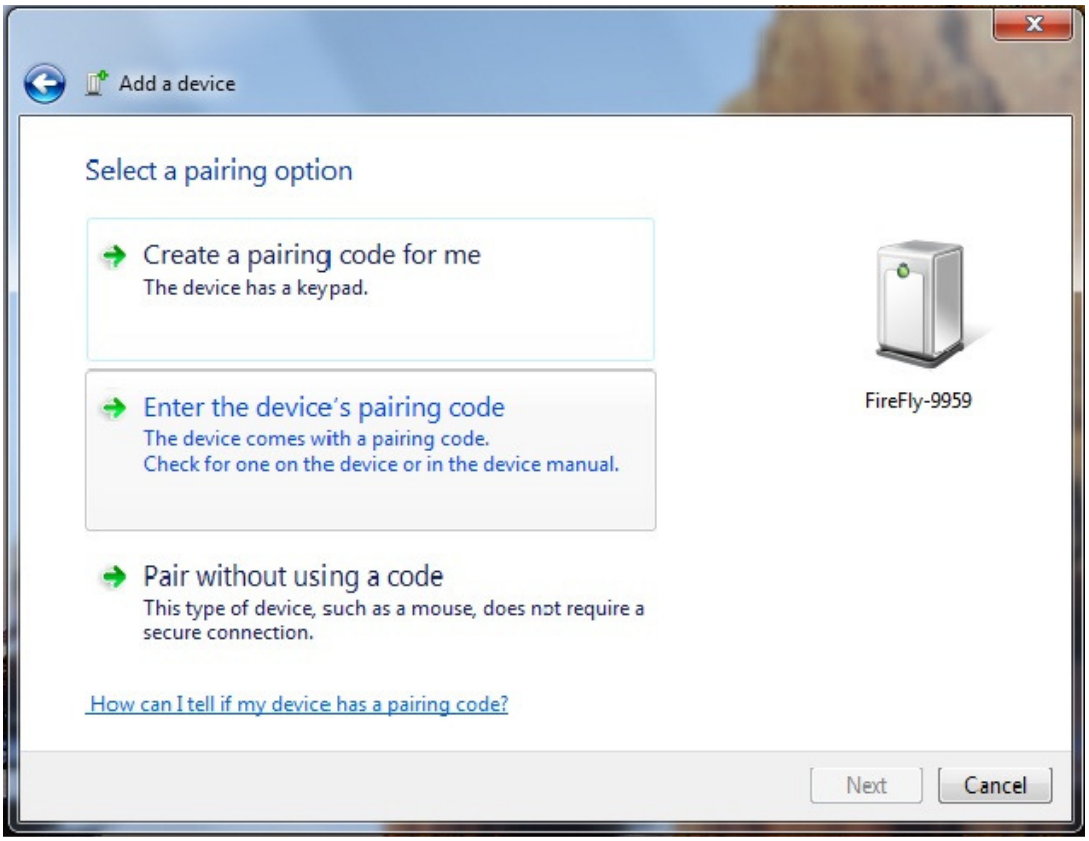
By default, the FireFly acts as a slave and the PC is the master. Connecting to the FireFly is done through the Bluetooth device manager which has a different look and feel in Window CE, 2K, XP, Vista and Windows 7. Regardless of the PC operating system, the process is essentially the same: Discovery, Pairing, and Connecting.

These processes are described below for a Windows 7 machine.

Discovery: The FireFly must be discoverable by simply turning it on. The Green LED should be blinking. On your PC open the Bluetooth device manager and click on "Add" a new device. The Bluetooth device manager is located in the bottom right corner of your screen in the taskbar. The Bluetooth device manager will display a list of all the Bluetooth devices that are discoverable. The FireFly will be displayed as "FireFly-XXXX" where XXX is the last 4 digits of the MAC address.



Pairing: Next you must pair with the device by double clicking on FireFly-XXXX in the list. Select "Enter the device's pairing code" option from the list. Enter the default pin code of 1234. Once the Bluetooth device manager completes you will see a message to the effect, "Bluetooth device installed on COMX" where COMX is unique to your machine. In some cases the Bluetooth device manager will create two COM ports, in this case you only want to use the COM port labeled "outgoing".


Add a device
Select a pairing option
Create a pairing code for me
The device has a keypad.
Enter the device's pairing code
The device comes with a pairing code.
Check for one on the device or in the device manual.
Pair without using a code
This type of device, such as a mouse, does not require a secure connection.
How can I tell if my device has a pairing code?
FireFly-9959
Next
Cancel

You only need to pair with the FireFly once.

Connecting: To establish a Bluetooth connection, open up the COM port assigned to the device from either your application or a terminal emulator. Once the COM port is open you will notice the green LED switches from blinking to solid ON. The device will remain connected until the COM port is closed or the FireFly is turned off.

Pin Codes and Link Keys

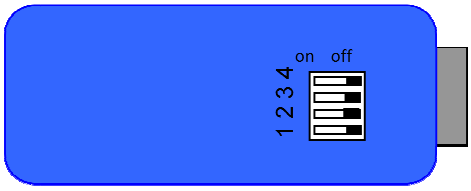
If either the local or the remote Bluetooth device has authentication enabled, the following process occurs.

1. The first time a connection is attempted, a "passkey" is required. This is a series of numbers or characters. (1234 is the default for the Roving Networks Bluetooth devices and modules)
2. Once this is entered, the remote Bluetooth device and local device compare their passkeys and if they match, a link key is generated, and stored. Usually, but not always this is stored by the remote device.
3. Upon subsequent connections, the devices will first compare link keys and if they are correct, no pin code will have to be re-entered.

If the remote device is a PC or PDA, a prompt is generally made to the user to enter this pincode. To remove the stored link key on the remote device, generally you "unpair" or remove the device from the Bluetooth manager. You can change the Pin Code to remove the link key on the FireFly. This will be forcing a new Pin Code exchange process to occur upon subsequent connection attempts.

NOTE: Only one Master can connect to the FireFly at a time.

Configuration Switches



The configuration switches on the top of the FireFly are small. You will need a paper clip or small screw driver to change them. Hold the devices with the DB9 connector facing to the right, the switches are numbered one to four from bottom to top and the off position is towards the DB9 connector.

1 – RESTORE FACTORY DEFAULTS

Set this switch ON, power up unit, and toggle the switch from ON-OFF-ON-OFF-ON to return the unit to factory settings. The GREEN LED flashes quickly for a moment and then continues to blink at about once per second.

2 - AUTO DISCOVERY

In slave mode, sets a special class of device that is used the master to auto connect. If Switch 3 also ON, the device performs a search, stores, and connects to a remote Roving Networks Bluetooth Device that has switch 2 set.

3 - AUTO MASTER

Device acts as Bluetooth master, auto-connects to a stored remote address. First set the Bluetooth address of the slave device using the SR command or through instant cable replacement settings.

4 - DEFAULT BAUD RATE

OFF = 115K will be overridden by software baud rate configuration commands, ON = 9600 ignores any software configuration

Operating Modes

The operating modes for the FireFly are set using the "SM" command when in command mode. The possible operating modes are:

Slave (SM,1<CR>) Default mode, whereby other Bluetooth devices can discover and connect to the FireFly

Master (SM,1<CR>) In this mode, the FireFly makes connections when a Connect Command "C", is received. This command can also contain the Bluetooth address of the remote device. If no device is specified, then the store remote address is used. The connection can be broken if the special break character or string is sent (use the SO command to set the break character) **This is a low speed connect mode**.

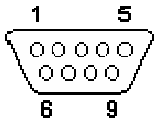
Trigger (SM,2<CR>) In this mode, the FireFly makes connections automatically when a character is received on the serial port. The connection will continue as long as characters are received on either end. There is a configurable timeout (which is set using the ST command) which will cause a disconnect after XX (from 1 to 254) seconds of inactivity. **This is a low speed connect mode**.

Auto Master (SM,3<CR>) In this mode, the FireFly makes connections automatically on powerup, and re-connects when connection is lost. This mode can also be enabled by setting Dip Switch #2. This is the high speed connect mode, and cannot be broken by software break characters.

In all master modes the device will not be discoverable or allow configuration remotely over Bluetooth.

Serial Connector Specification

DB9 connector Pin Out



Pin	RN-240M Male DB9	RN-240F Female DB9	RN-422M Male DB9
1	NC	NC	NC
2	RXD	TXD	NC
3	TXD	RXD	RXD-
4	NC	NC	TXD+
5	GND	GND	GND
6	NC	NC	+5 VDC (input)
7	RTS	CTS	RXD+
8	CTS	RTS	TXD-
9	4-12VDC	4-12VDC	NC

NOTE: The RS422 interface uses the MAX490 transceiver. This device is designed to operate with input voltage range of 4.75 to 5.25 VDC.

RXD+ and TXD+ each have a 4.7K pull up to 5VDC.
RXD- and TXD- each have a 4.7K pull down to GND.

NOTE: The RS232 interface uses the SIPEX SP3232ECA chip with capacitor switch to generate the + and – signals and thus is not driving the full RS232 voltages. Devices stealing power from the RS232 pins may not have enough voltage.

Device Configuration

The default configuration for the FireFly is

- Bluetooth slave mode
- Bluetooth pin code 1234
- Serial port 115K baud rate, 8 bits, NP, 1 stop bit
- Serial port flow control disabled
- Low power mode off

Configuration is done by putting the FireFly into command mode and sending ASCII commands. This can be done over the serial port or over the Bluetooth link.

Once you change the configuration parameters, they persist until changed or a factory reset is performed.

Local configuration over the serial port

Connect the FireFly to the serial port your computer. You may need a null-modem cable (DB9 pins 2 and 3 swapped) if you have a RN-240M or a straight cable if you have a RN-240F. If your computer does not have a serial port you can use a USB serial cable such as the RN-USB-SERIAL to connect the FireFLy to your computer.

With the FireFly connected and powered on, start your favorite terminal emulator and open the COM port that the serial interface or serial USB is connected to. (A free terminal emulator, TeraTerm for the PC is available at www.rovingnetworks.com/support/teraterm.zip)

The communication settings of the terminal emulator should match the default serial port settings of the FireFly BP of 115,200Kbps, 8 bits, No Parity, 1 stop bit.

Remote Configuration over Bluetooth

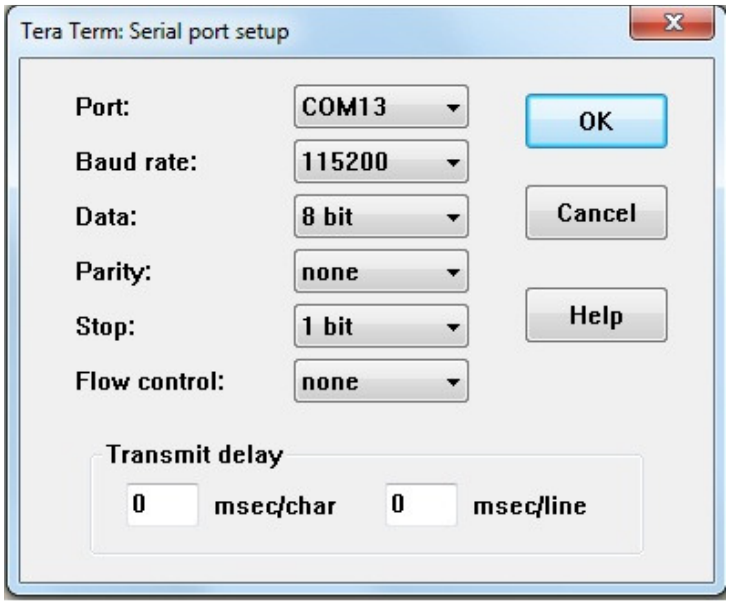
NOTE:
Remote configuration can only occur if the bootup configuration timer (default 60 seconds) has not expired. This timer is set to 0 (remote config disabled) for master mode, and auto-connect slave mode, so that data can immediately flow between the 2 devices in cable replacement fashion.

You must first pair the Bluetooth device with your computer. Click on the "Bluetooth devices" icon in the system tray at the bottom right of your computer. Select "Add a Bluetooth device"

Roving Netowrks recommends you download the free TeraTerm program from our website (www.rovingnetworks.com/support/teraterm.zip), as we have found many bugs with Hyperterminal that render it ineffective in talking to local serial ports.

Getting into command mode

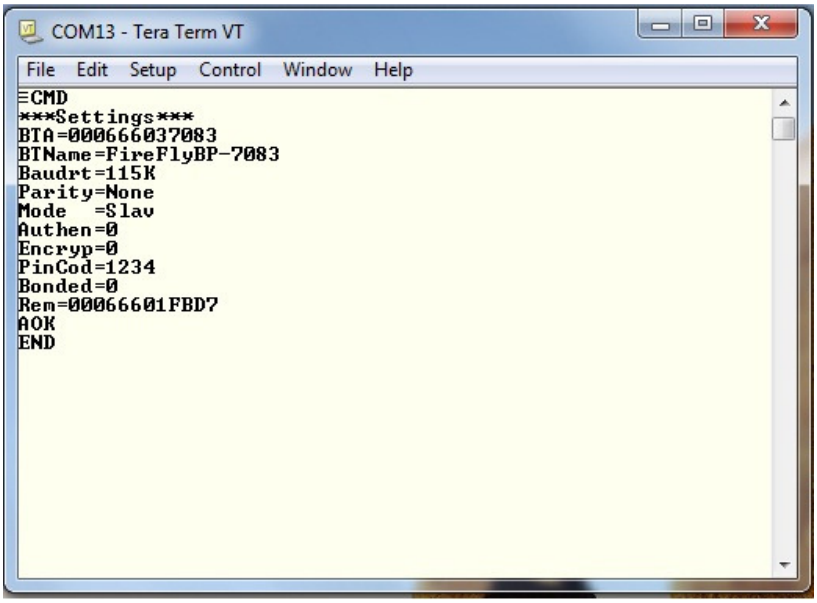
Launch TeraTerm and make sure that the default settings are selected (115,200Kbps, 8 bits, No Parity, 1 stop bit). You can change these settings by clicking on Setup → Serial Port from within TeraTerm.



Type $$$ into the terminal emulator (3 dollar signs). You should see **CMD** returned to you. If you see **CMD** you know that your connection and terminal settings are correct.

Entering a valid command will return an **AOK**, invalid syntax returns **ERR**, and unrecognized commands will return a **?**. Type "h"<cr> to see a list of commands, and "d"<cr> to see a summary of current settings.

To return to data mode, type
"---" (3 minus signs) <cr>, or reset the device and connect again.



Command Summary

All configuration information is stored in flash memory. The "set" command modifies the flash memory however the Bluetooth module only reads the configuration from flash when powering up or after a reboot.
Some examples of common configuration commands:

SU,9600	sets Uart Baudrate to 9600
SN,myname	sets Bluetooth name to "myname"
SA,1	enables secure authentication
SP,secret	sets security pincode to "secret"
SF,1	restores all values to factory defaults
R,1	reboots the module

Set commands

S7,<1,0>	7 bit data mode. 1 to enable, 0 to disable. (setting can be seen with the "d" command).
SL,<E,O,N>	Set UART parity. Can be any of, Even, Odd, or None. Only the first character is needed and must be capital.
SU,<rate>	Baudrate, {1200, 2400, 4800, 9600, 19.2, 28.8, 38.4, 57.6, 115K, 230K, 460K, 921K }, only the first 2 characters are needed.
SN,<name>	Name of the device, 20 characters maximum. Example: *"SN,MyDevice"*
SS,<text>	Service Name (1 to 20 characters).

S-,<name> Serialized Friendly Name of the device, 15 characters maximum. This command will automatically append the last 2 bytes of the BT MAC address to the name. Example: *S-,MyDevice* will set the name to "MyDevice-ABCD"

SC,<hex word> Service Class (four hex values, 11 bits used) this is used with Device Class command below to create the 24 bit Class of Device number.

SD,<hex word> Device Class (four hex values, major and minor in a 16 bit word, used with service class above)
To set the Class of Device (COD) to 0x1F0123 use the commands
SC,001F
SD,0123

SM,<5,4,3,2,1,0> Mode (0=slave, 1=master,2=trigger, 3=auto, 4=DTR, 5=ANY)

SR,<address> Store remote address, 12 hex digits, (6 bytes) no spaces or characters between digits
Example: *SR,00A053112233* sets the remote Bluetooth address to *00A053112233*
NOTE there are two special characters that can be used for the address parameter:
SR,Z will erase any stored address.
SR,I will write the last address seen using the inquiry command.
This can be helpful when you just have only one other device in range.

S?,<0,1> Role Switch. Enables and disables Role Switch. If set, when an incoming connection is occurs to a slave mode device, an attempt will be made to force a role switch, allowing the slave to become the master. This is useful in situations where high speed data is being sent from the local device up to the remote host, and can result in better performance. However this may create a situation whereby the connecting host will not be able to make additional outbound connections (multipoint) while connected to this device. Default is DISABLED.

SE,<1,0> Encryption 1 to enable, 0 to disable.

SP,<text> Security pin code, 20 character maximum. Each time the device success pairs, the BT address will be saved. Up to eight addresses can be stored on a first in first out bases. To erase all stored pairings, reset the passkey command. You can use the same value that is already set.

ST,<number> Configuration timer, number of seconds (range= 0 to 255 decimal) to allow remote configuration over Bluetooth after power up in Slave Mode. In all Master modes, the remote configuration timer is set to 0 (no remote configuration). In Trigger Master Mode, the configuration timer is used as an idle timer to break the connection after time expires with no characters being received.

VALUE (decimal)	DESCRIPTION
0	No remote config, No local config when connected
1-252	Time in seconds from power up to allow config
253	Continous config LOCAL only
254	Contiuous config, REMOTE only
255	Continous config, both LOCAL and REMOTE

SW,<hex word> Enable low power SNIFF mode. See Low Power section

S|,<value> Low power connect mode.

S$,<char> Configuration detect character. This allows a change from the default $$$ to some other character.

SF,1 Set Factory Defaults.

Display commands:

D Display basic settings.
E Display extended settings
O Display other settings
G<X> Display stored settings for command X. These commands correspond to the SET commands above.
GB Returns the Bluetooth Address of the device.
GK Returns the current connection status: 1=connected, 0 = not connected.
V Return the software release version

Action Commands

+ Local echo. Toggle local echo of RX chars in command mode only. (default is off).
C Attempt to connect to the REMOTE stored address.
C,<address> Connect to the address specified in hex format. The address is also stored as the REMOTE address.

CF<address> Connect and immediately go into FAST data mode. NOTE: you will not be able to enter command mode while connected. PIO6 can still be used to disconnect. Thus PIO6 should be held HIGH before sending this command, as lowering PIO6 will cause a disconnect.

CFI Connect and immediately go into FAST data mode using the LAST address found from the Inquiry command. NOTE: you will not be able to enter command mode while connected. PIO6 can still be used to disconnect.
CFR Connect and immediately go into FAST data mode using the REMOTE address. Similar to the C command but bypasses the configuration timer.

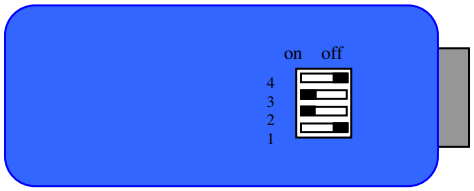
CT<address>,<timer> Connect with TIMER. The device will NOT use or store the remote address, rather will make a connection to the <address> (REQUIRED). The device will automatically disconnect after 7 seconds if no data is seen from UART or BT. An optional timer value can be entered to change the timer. This value is in ¼ seconds. So for a 30 second timer, use 120 as the value. The maximum value is 255 (64 seconds)

K, Kill (disconnect) from the current connection**.** The characters KILL<cr><lf> will be echoed to the local UART once the connection is broken.
F,1 Go into fast data mode, ends configuration immediately.
H Help, will print out a list of commands and their basic syntax
R,1 Forces a complete reboot of the device (similar to a power cycle

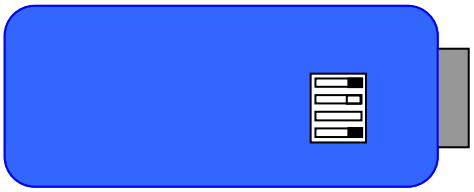
Instant Cable Replacement

Using two Roving Networks Bluetooth serial adapters or FirePlug (RN-USB-X) USB dongle, with the power OFF set the switches on each device as shown below.

Master mode
Auto discovery and auto Master on



Slave
Auto discovery on

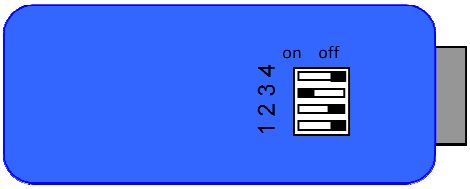


Power up both devices and the master will discover the slave device, store its Bluetooth address and connect. The devices are now paired and the green LED on each device should be on solid.

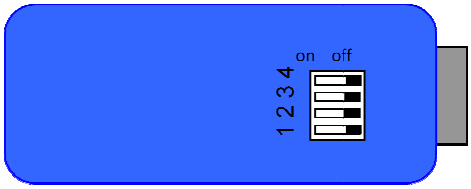
After pairing, set switch 2 on both devices to OFF so that they don't try to re-pair each time power is cycled.

Once paired, every time the devices get in range of one another they will connect and the master will not attempt to connect to any other Bluetooth device.

Master mode



Slave



To break this pairing restore the factor defaults using dip switch 1.

For more information on the instant cable replacement, please refer to the 'Instant Cable Replacement Application Note" posted on our website.